



# Monitoring Limber Pine Health in the Rocky Mountains (INT-EM-06-03 (Base EM))

(Year 3 of a 3-year Study)

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## Introduction

Limber pine is an ecologically and culturally important species that is widely distributed within the Rocky Mountains, yet little studied. Recent surveys suggest that significant ecological impacts are occurring as the result of the exotic, invasive disease, white pine blister rust (WPBR). Information is needed on the long-term ecological impacts of this disease to facilitate management and restoration efforts.

## Objectives

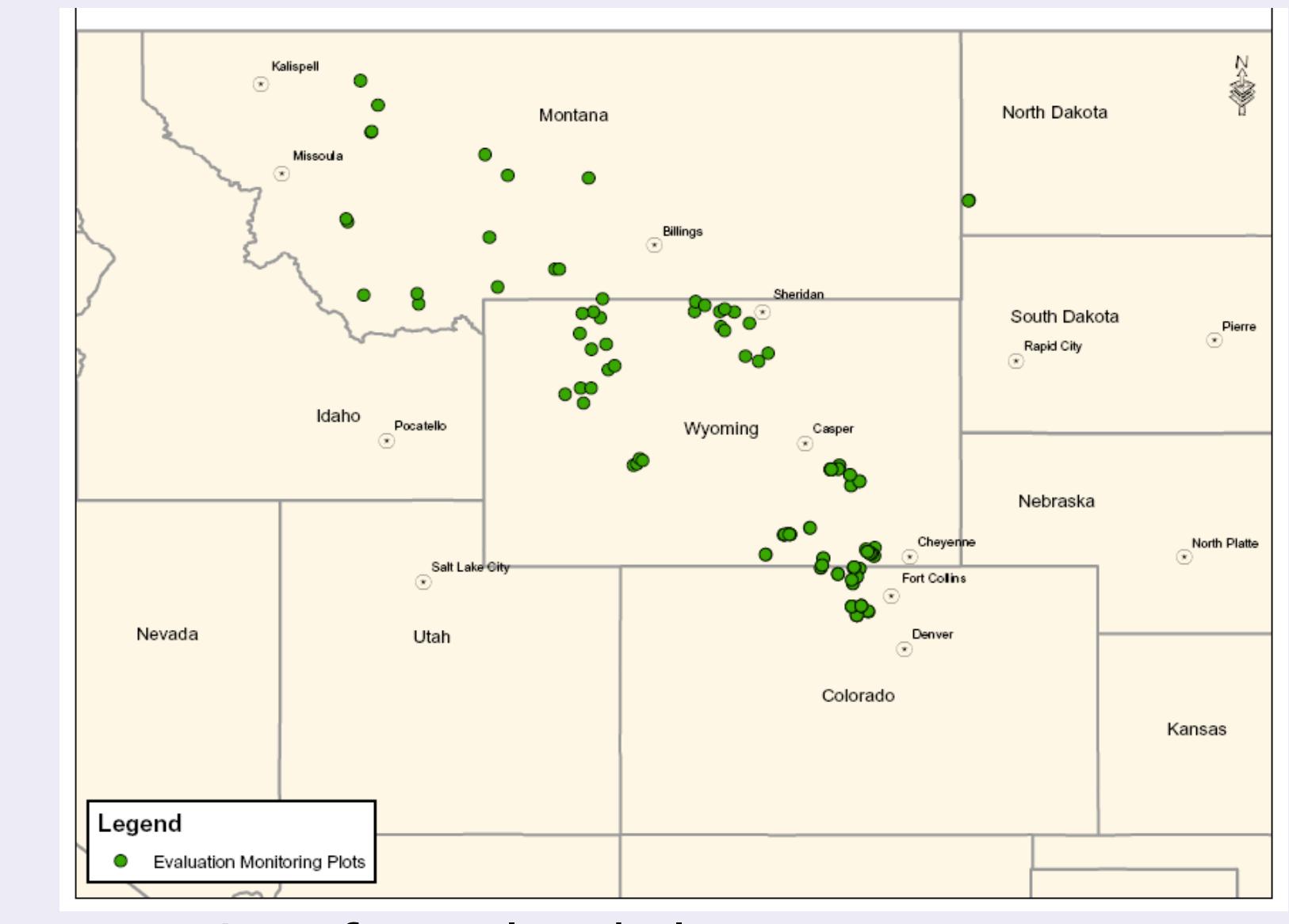
This study was conducted to assess the ecological impacts of WPBR on limber pine stands within the Rocky Mountains and to gather baseline information needed to sustain, protect, and restore impacted stands.



Intensive measurements were taken to characterize crown impacts.



Plot information is being used to identify candidate trees for cone collections and future restoration projects.

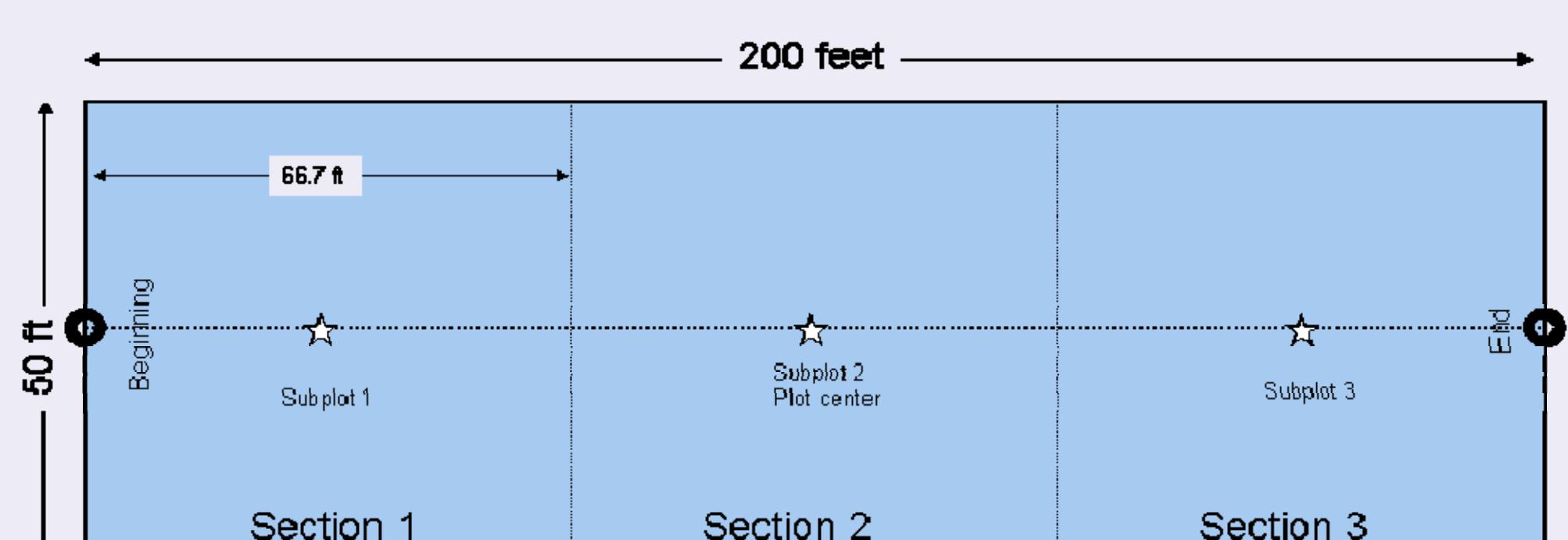


Location of completed plots.

## Methods

- Eighty-three monitoring plots were installed in 4 study areas: 1) northern Colorado and southern Wyoming, 2) central and western Wyoming, 3) central Montana, and 4) southwestern North Dakota.
- Methods were adapted from the Whitebark Pine Ecosystem Foundation.
- Site data collected included: elevation, slope, aspect, stand structure, slope position, and disturbance history.
- Tree variables included: species\*; DBH\*; height\*; health status\*; crown class\*; crown ratio; % canopy killed; incidence of cones; number, size, severity, and location of WPBR cankers; and other damages and severities.
- Three subplots were established to measure regeneration and understory vegetation.

\*variables collected on all species



Plots were belt transects. All trees  $\geq 4.5$  ft tall were measured. Understory vegetation & regeneration were measured in three subplots.

## Results

Dwarf mistletoe and mountain pine beetle were rare in all study areas with average plot incidences of infected/infested trees at 4% and 3%, respectively. North Dakota is out of the documented range of these agents. Twig beetles were common in most study areas with average plot incidences of infected trees at 35%, although their impacts were minor.

### WPBR Summary by Location

Northern CO and Southern WY:

- eighty-one percent of plots had WPBR,
- average incidence of infected plots was 29%.

Central and Western Wyoming:

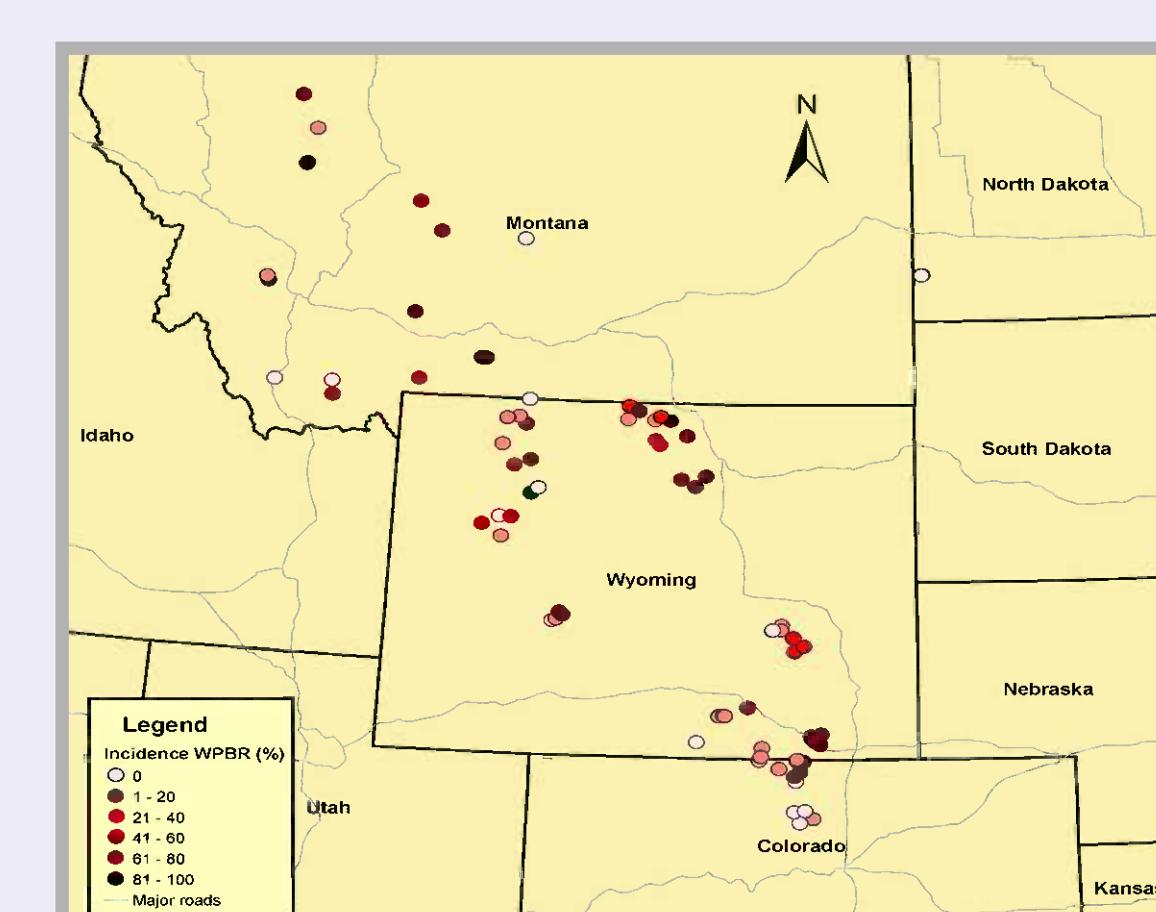
- eighty-six percent of the plots had WPBR,
- average incidence for infected plots was 37%.

Central Montana:

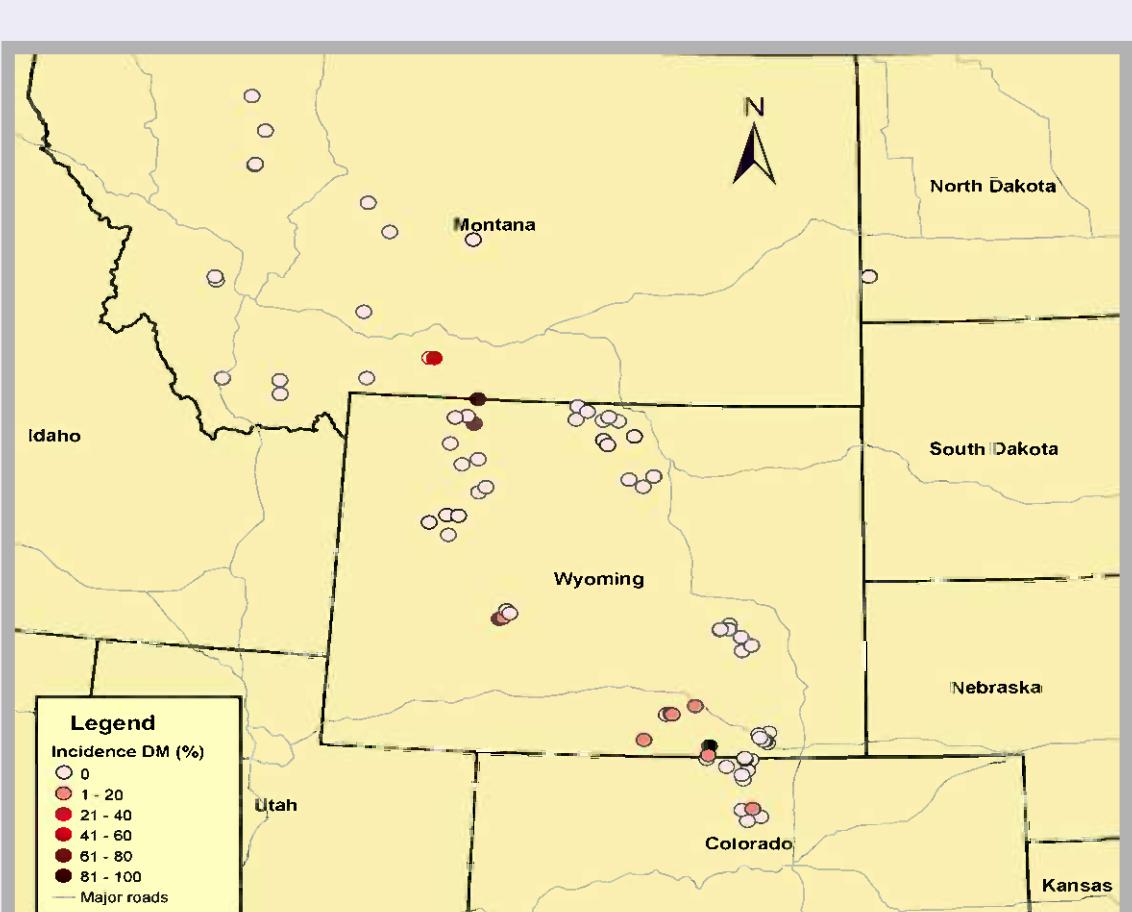
- eighty-one percent of plots had WPBR,
- average incidence for infected plots was 49%.

North Dakota:

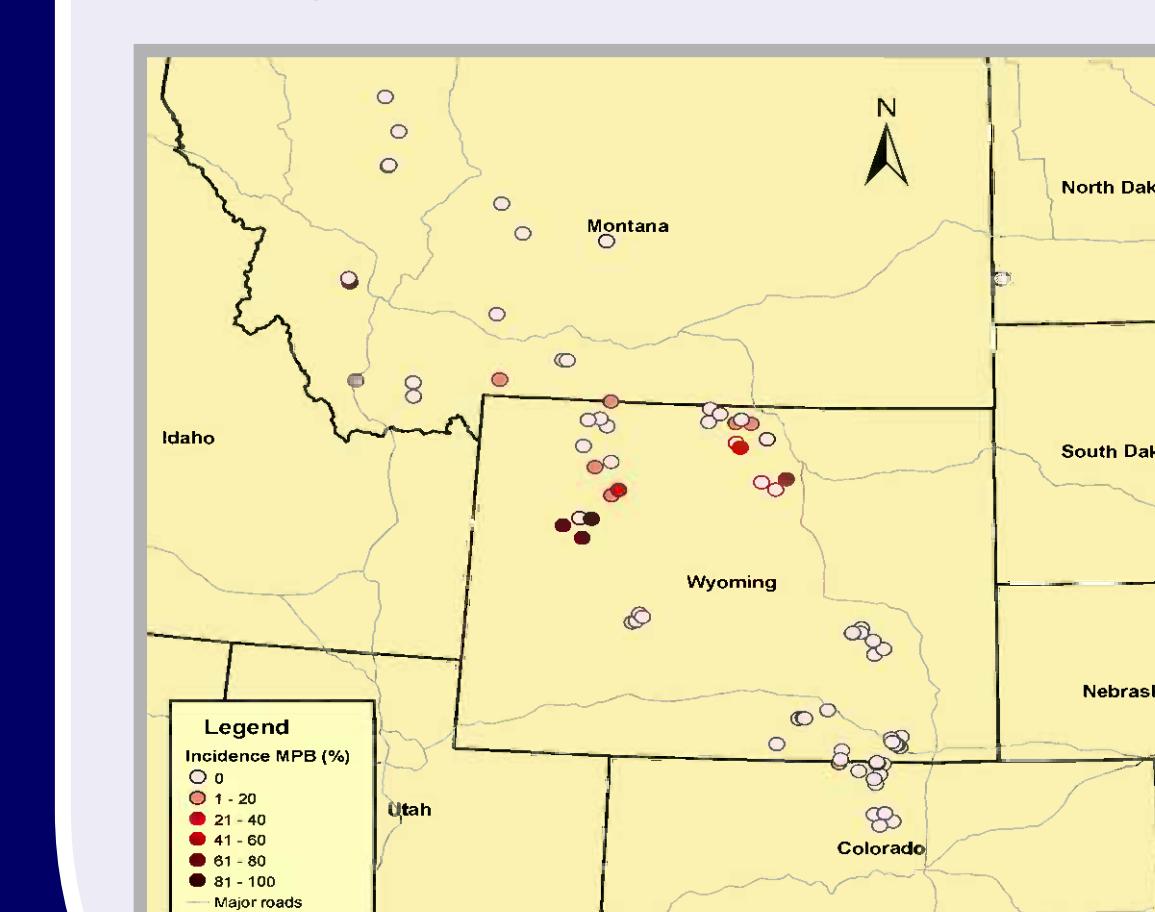
- no WPBR was detected.



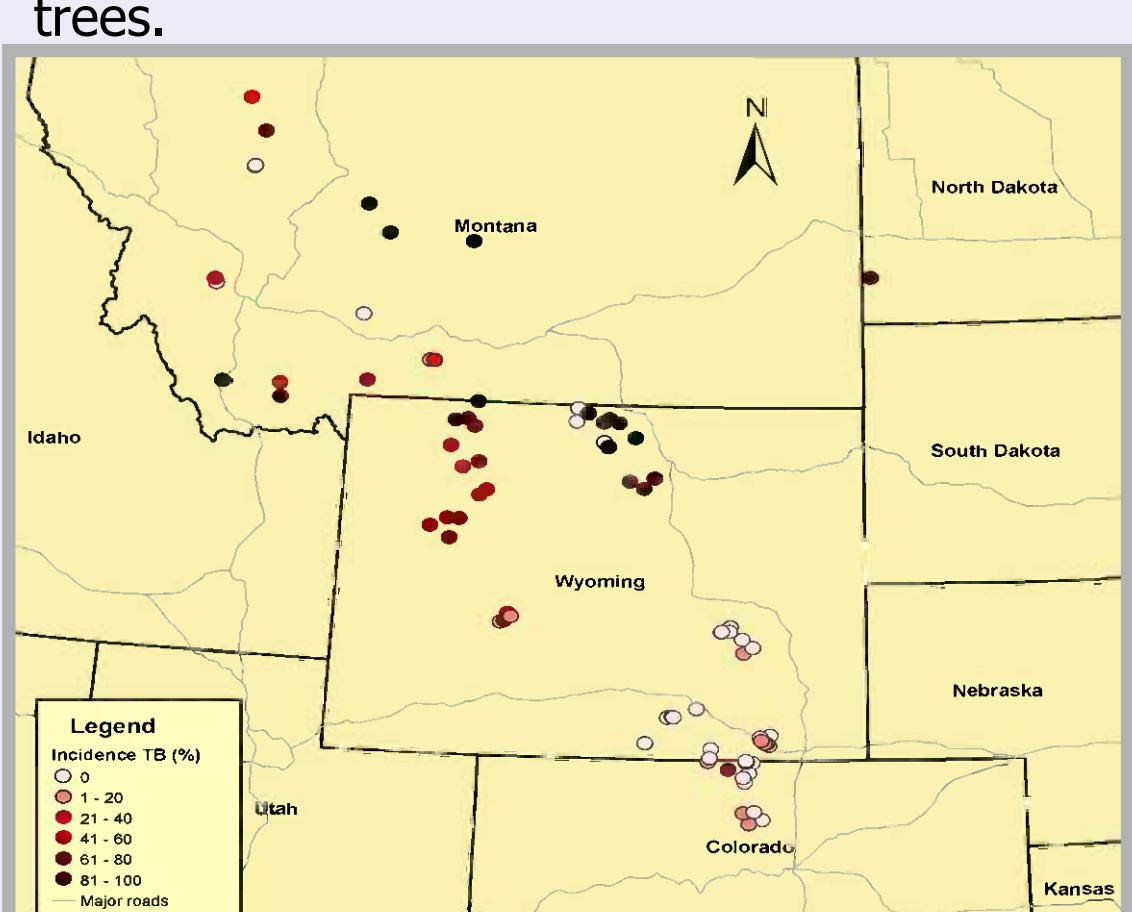
Average incidence of WPBR infected trees.



Average incidence of dwarf mistletoe infected trees.



Average incidence of mountain pine beetle infested trees.



Average incidence of twig beetle infested trees.

\* A final report is planned for 2009.